

Communications system having roaming facilities.

BACKGROUND OF THE INVENTION

The invention relates to a communications system, comprising several communications networks, and means for facilitating roaming for users on said several communications networks.

It is known that PLMN operators [PLMN = Public Land Mobile Network] mutually conclude roaming agreements. Such agreements, which regulate that subscribers of one PLMN may, and can, make use of another PLMN (this is called roaming) so far must always be gone into bilaterally between the several PLMN operators mutually. In addition, technical provisions which make all this possible, such as coupling network signalings, must be undertaken bilaterally. In this manner, roaming additionally is possible only between different PLMNs, but not between PLMNs and PSTNs (= Public Switched Telephone Networks).

SUMMARY OF THE INVENTION

It is the object of the invention to overcome said drawbacks. To this end, the invention provides for operators of telecommunications networks, i.e., PLMNs or PSTNs, to each conclude a bilateral roaming agreement with a global communications network - to which a satellite-communications network (= SCN) is particularly suited - and that in doing so the technical means are provided for realising said agreement. By way of only one agreement, namely, by the SCN, each PLMN or PSTN, as the case may be, receives roaming facilities with all other PLMNs and PSTNs which have also concluded such an agreement with the SCN. The telecommunications network concluding an agreement with the SCN should, for the purpose of realising said agreement, bring about a signalling coupling with the SCN. The SCN then provides signalling links with all telecommunications networks with which a roaming agreement has been concluded as well. There is therefore required only one signalling link with the SCN to obtain roaming with all networks connected to the SCN. The invention is based on the insight that an SCN, apart from as a platform for satellite communication, due to its far-reaching global setup and arrangement, is extremely suitable as a roaming platform ("facilitator") for different PLMNs and PSTNs.

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IMPLEMENTATION

Below, the invention will be further explained by reference to several figures.

A calling user of a mobile terminal has a SIM card (SIM = Secure Identification Module) in which there is programmed an IMSI (= International Mobile Subscriber Identity). The IMSI consists of 15 positions, the first three of which standard denote the country of origin of the Network Operator (= NO) of the mobile user, the fourth and fifth denote the NO of the mobile user and the remaining ten positions may be freely completed by the NO. In the IMSI of users of an NO who - according to the invention - has concluded an agreement with the SCN, the first (three) digits of the field to be freely completed constitute a VNO code (VNO = Virtual Network Operator). Said VNO code is assigned, by a control module of the SCN, to each PLMN or PSTN with which the SCN, as may be seen from an entry into a VNO-code register (= VCR), has concluded a bilateral roaming agreement. It should be noted that a VNO is understood to mean an organisation managing a communications system having one or more network working elements (e.g., an HLR [= Home Location Register]) with which the VNO may add value to a base telecommunications service. In doing so, the VNO disposes, or not, of its own network (PLMN or PSTN).

PLMN subscribers roaming on a guest PLMN

When a (calling) user switches on his mobile terminal, a link is established between the mobile terminal and a VNO base station (in this case a PLMN) where the user wants to roam. In this case, the mobile terminal transmits the IMSI number of the SIM. The VNO network attempts to analyse at least the first 8 positions, in order to determine whether it concerns a home user (client of the own PLMN) or a roaming user (client of another PLMN). If analysis on the first 8 positions is impossible, or it concerns a roaming user, it is determined, on the basis of the first 5 positions, whether a roaming agreement has been concluded between the PLMN and the SCN. If, according to the contents of the VCR, a roaming agreement does indeed exist, a request for information on the user is placed, by way of signalling, with the SCN, which carries out an analysis on the VNO code to determine to which VNO the request must be passed on. The VNO will make available the requested information, by way of signalling, to the satellite network, which passes it on to the guest PLMN. If the calling user is accepted by the guest PLMN, said

information will be stored in the home PLMN in a Home Location Register (= HLR) and in the guest PLMN in a Visiting Location Register (= VLR). The costs of the communication by way of the PLMN are charged to the calling user by the home network.

Said procedures are in agreement with the current procedures laid down for roaming, and both said procedures and the means serving to carry them out are generally known.

Roaming on nonmobile networks

A nonmobile network (PSTN) may also facilitate roaming of mobile users or clients of another PSTN, provided that said PSTN is extended with the option of being capable of identifying and recording users; to this end, it should dispose of several network elements, such as HLR, VLR, Authentication Centre, Extended memory. Identification is effected by means of the IMSI on a SIM card and peripheral equipment made suitable for this purpose in the PSTN or a cordless-identification option.

PLMN- or PSTN-subscriber roaming on a PSTN

If a calling user ends up within the range of a transceiver station connected to a PSTN of a cordless system (e.g., a DECT [= Digital Enhanced Cordless Telecommunications]) and he disposes of a set wherein cordless communication is possible, he may make use of communication by way of the PSTN. Identification and communication between the PSTN and the SCN, and between the SCN and the home PLMN, is effected in accordance with the description above. The costs of the communication by way of the PSTN are charged to the calling user by the home network.

Due to the absence of a base station which determines the location of the roaming user (such as in the PLMN), the location of the roaming user on the PSTN is determined on the basis of the A-number (country code + network code + subscriber number) of the terminal to which the cordless transceiver station is connected. The user is accessible on the PSTN by way of his own (mobile) telephone number. *PSTN subscribers roaming on a PLMN or PSTN*

Wireline terminals may also make use of the aforementioned facilities. The terminal of a calling user does have to be provided with a SIM card identical to a SIM card for mobile terminals in PLMN networks. When the SIM card is inserted into a (public) terminal suitable for that purpose, identification and communication between the PSTN and the SCN, and between the SCN and the home PLMN or home

PSTN, take place in accordance with the procedure described above. Due to the absence of a base station which determines the location of the roaming user (such as in the PLMN), the location of the roaming user on the PSTN is determined on the basis of the A number (country code + network code + subscriber number) of the terminal to which the (public) terminal is connected. The user is accessible on the wireline set (PSTN) by way of his own (mobile) telephone number.

The costs of the communication by way of the PSTN are charged to the calling user by the home PSTN or home PLMN.

The enclosed figures provide an illustration of the invention. FIG. 1 shows the state of the art, in which several PLMNs conclude agreements with one another, and establish signalling channels and control modules for realising roaming facilities for the subscribers of said several PLMNs. FIG. 2 shows the architecture according to the invention, PLMNs and also PSTNs realising roaming facilities by way of a Satellite-Communications Network (= SCN) which is used here as a common roaming platform (facilitator). FIG. 3 shows a further elaboration of FIG. 2. An SCN connects several Land Earth Stations (= LESS) to one another. These are the earth stations for satellite communication. The satellites with which said earth stations are communicating have not been drawn since said satellites per se have no function in the system according to the present invention. In conformity with the invention, the SCN - apart from the standard function of facilitating communication by way of satellites - accomplishes the function of facilitating roaming for subscribers who have entirely different operator networks, PSTNs and PLMNs, as their home network, in other words, to which they are subscribing. In conformity with the invention, operators of different PLMNs or PSTNs each conclude a bilateral roaming agreement with the SCN. [The technical means for realising said agreements between the several PLMNs and PSTNs, respectively, and the SCN, comprise a register, the Virtual Network Operator Code Register VCR, which is located within the SCN, and may be approached under control of a control module CTR.

The VCR may consist of one register, which may be approached and interrogated by the several LESS; if so desired, each LES may be provided with a copy VCR - to be continuously kept up to date - having (distributed) control means (CTRs). By way of one agreement with the SCN, technically to be realised by assigning, to the PLMN or PSTN, a VNO code (= VNC) and entering said VNC into the VCR, each PLMN or PSTN, respectively, entered into the VCR obtains roaming

facilities with all other PLMNs and PSTNs entered into the VCR. Upon entry into the VCR, there is also realised - under control of the control module CTR - a signalling coupling (interface) between the PLMN and PSTN entered, respectively, and the SCN. By way of the SCN, all entered PLMNs and PSTNs are then capable of exchanging signalling traffic - in this case, roaming information - with one another. This way, the SCN is used, apart from as a platform for satellite communication, by way of the VCR and the signalling couplings corresponding thereto, as an interworking platform for facilitating roaming between the several PLMNs and PSTNs.

As indicated above, the system proposed by the invention makes use of SIM cards having an IMSI adjusted for roaming. Such a SIM card is shown in FIG. 4. Standard are the country and operator codes, five characters in all. The ten remaining character positions not laid down in standards, are used in the system according to the invention for laying down, inter alia, the VNO code (three characters) of the home PLMN or PSTN, respectively.

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